

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

1. (Currently amended) A polymer electrolyte fuel cell comprising:
an electrode including a catalyst layer and a diffusion layer, said catalyst layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,
wherein a structure of said catalyst layer differs between at said upstream portion and at said downstream portion, said upstream portion of said catalyst layer having a structure for preventing a drying-up of said cell, said downstream portion of said catalyst layer having a structure for preventing a flooding of said cell;
wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes each of the following (1) – (4) structures:
 - (1) said catalyst layer includes a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is larger at said upstream portion than at any other portion of the catalyst layer;
 - (2) said catalyst layer includes pores, wherein a pore size of said catalyst layer is smaller at said upstream portion than at any other portion of the catalyst layer;
 - (3) said catalyst layer includes pores, wherein a pore amount of said catalyst layer is smaller at said upstream portion than at any other portion of the catalyst layer;
and
 - (4) a thickness of said catalyst layer is greater at said upstream portion than at any other portion of the catalyst layer;and wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes each of the following (1) – (4) structures:

(1) said catalyst layer includes a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is smaller at said downstream portion than any other portion of the catalyst layer;

(2) said catalyst layer includes pores, wherein a pore size of said catalyst layer is larger at said downstream portion than at any other portion of the catalyst layer;

(3) said catalyst layer includes pores, wherein a pore amount of said catalyst layer is larger at said ~~upstream~~ downstream portion than at any other portion of the catalyst layer; and

(4) a thickness of said catalyst layer is smaller at said downstream portion than at any other portion of the catalyst layer.

2. (Original) A fuel cell according to claim 1, wherein said structure of said catalyst layer varies gradually along said reactant gas flow direction.

3. (Original) A fuel cell according to claim 1, wherein said structure of said catalyst layer varies in a step-wise manner along said reactant gas flow direction.

4. (Canceled)

5. (Canceled)

6. (Original) A fuel cell according to claim 1, said diffusion layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said diffusion layer differs between at said upstream portion and at said downstream portion, said upstream portion of said diffusion layer having a structure for preventing a drying-up of said cell, said downstream portion of said diffusion layer having a structure for preventing a flooding of said cell.

7. (Previously presented) A fuel cell according to claim 6, wherein said structure of said diffusion layer varies gradually along said reactant gas flow direction.

8. (Previously presented) A fuel cell according to claim 6, wherein said structure of said diffusion layer varies in a step-wise manner along said reactant gas flow direction.

9. (Previously amended) A fuel cell according to claim 6, wherein said structure of said diffusion layer for preventing a drying-up of said cell at said upstream portion includes each of the following (1) – (4) structures:

(1) said diffusion layer includes pores, wherein a pore size of said diffusion layer is smaller at said upstream portion than at any other portion of the diffusion layer;

(2) said diffusion layer includes pores, wherein a pore amount of said diffusion layer is smaller at said upstream portion than at any other portion of the diffusion layer;

(3) said diffusion layer has a water repellent layer and a substrate layer, wherein a hydrophobicity of said water repellent layer of said diffusion layer is stronger at said upstream portion than at any other portion of the diffusion layer; and

(4) a thickness of said diffusion layer is greater at said upstream portion than at any other portion of the diffusion layer.

10. (Currently amended) A fuel cell according to claim 6, wherein said structure of said diffusion layer for preventing a flooding of said cell at said downstream portion includes each of the following (1) – (4) structures:

(1) said diffusion layer includes pores, wherein a pore size of said diffusion layer is larger at said ~~upstream~~ downstream portion than at any other portion of the diffusion layer;

(2) said diffusion layer includes pores, wherein a pore amount of said diffusion layer is larger at said downstream portion than at any other portion of the diffusion layer;

(3) said diffusion layer has a water repellent layer and a substrate layer, wherein a hydrophobicity of said water repellent layer of said diffusion layer is weaker at said downstream portion than at any other portion of the diffusion layer; and

(4) a thickness of said diffusion layer is smaller at said ~~upstream~~ downstream portion than at any other portion of the diffusion layer.

11. (Previously presented) A fuel cell according to claim 10, wherein said water repellent layer of said diffusion layer includes a fluororesin and carbon particles as components of said water repellent layer, and wherein in order to weaken the hydrophobicity of said water repellent layer of said diffusion layer at said downstream portion, said diffusion layer includes each of the following (1) – (3) structures:

(1) a ratio in amount of said fluororesin to all of the components of said water repellent layer smaller at said downstream portion than at any other portion of said diffusion layer;

(2) a hydrophilicity of carbon of said water repellent layer stronger at said downstream portion than at any other portion of said diffusion layer; and

(3) said substrate layer of said diffusion layer having had a hydrophilic procedure applied at said downstream portion.

12. (Currently amended) A polymer electrolyte fuel cell comprising:
an electrode including a catalyst layer and a diffusion layer, said catalyst layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said catalyst layer differs between at said upstream portion and at said downstream portion, said upstream portion of said catalyst layer having a structure for preventing a drying-up of said cell, said downstream portion of said catalyst layer having a structure for preventing a flooding of said cell;

wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in

amount of the same resin as the electrolyte to all of the components of said catalyst layer is larger at said upstream portion than at any other portion of the catalyst layer;

wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is smaller at said downstream portion than any other portion of the catalyst layer;

said diffusion layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said diffusion layer differs between at said upstream portion and at said downstream portion, said upstream portion of said diffusion layer having a structure for preventing a drying-up of said cell, said downstream portion of said diffusion layer having a structure for preventing a flooding of said cell, said diffusion layer having a water repellent layer and a substrate layer [[.]] ; and

wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes a thickness of said catalyst layer being greater at said upstream portion than at any other portion of the catalyst layer.

13. (Previously presented) The polymer electrolyte fuel cell of claim 12, wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes said catalyst layer comprising pores, a pore size of said catalyst layer being smaller at said upstream portion than at any other portion of the catalyst layer.

14. (Previously presented) The polymer electrolyte fuel cell of claim 12, wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes said catalyst layer comprising pores, a pore amount of said catalyst layer being smaller at said upstream portion than at any other portion of the catalyst layer.

15. (Canceled)

16. (Canceled)

17. (Currently amended) The polymer electrolyte fuel cell of claim 42 19, wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes said catalyst layer comprising includes pores, wherein a pore size of said catalyst layer is larger at said downstream portion than at any other portion of the catalyst layer.

18. (Currently amended) The polymer electrolyte fuel cell of claim 42 19, wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes said catalyst layer comprising pores, wherein a pore amount of said catalyst layer is larger at said ~~upstream~~ downstream portion than at any other portion of the catalyst layer.

19. (Currently amended) ~~The polymer electrolyte fuel cell of claim 12,~~
A polymer electrolyte fuel cell comprising:
an electrode including a catalyst layer and a diffusion layer, said catalyst layer
being sectioned into a plurality of portions including an upstream portion and a
downstream portion along a reactant gas flow direction,
wherein a structure of said catalyst layer differs between at said upstream portion
and at said downstream portion, said upstream portion of said catalyst layer having a
structure for preventing a drying-up of said cell, said downstream portion of said catalyst
layer having a structure for preventing a flooding of said cell;
wherein said structure of said catalyst layer for preventing a drying-up of said cell
at said upstream portion includes said catalyst layer comprising a coating of the same
resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in
amount of the same resin as the electrolyte to all of the components of said catalyst
layer is larger at said upstream portion than at any other portion of the catalyst layer;

wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is smaller at said downstream portion than any other portion of the catalyst layer;

said diffusion layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said diffusion layer differs between at said upstream portion and at said downstream portion, said upstream portion of said diffusion layer having a structure for preventing a drying-up of said cell, said downstream portion of said diffusion layer having a structure for preventing a flooding of said cell, said diffusion layer having a water repellent layer and a substrate layer; and

wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes a thickness of said catalyst layer being smaller at said downstream portion than at any other portion of the catalyst layer.

20. (Currently amended) The polymer electrolyte fuel cell of claim 42 23, wherein said structure of said diffusion layer for preventing a drying-up of said cell at said upstream portion includes said diffusion layer comprising pores, wherein a pore size of said diffusion layer is smaller at said upstream portion than at any other portion of the diffusion layer.

21. (Currently amended) The polymer electrolyte fuel cell of claim 42 23, wherein said structure of said diffusion layer for preventing a drying-up of said cell at said upstream portion includes said diffusion layer comprising pores, wherein a pore amount of said diffusion layer is smaller at said upstream portion than at any other portion of the diffusion layer.

22. (Currently amended) The polymer electrolyte fuel cell of claim 42 23, wherein said structure of said diffusion layer for preventing a drying-up of said cell at

said upstream portion includes a hydrophobicity of said water repellent layer being stronger at said upstream portion than at any other portion of the diffusion layer.

23. (Currently amended) ~~The polymer electrolyte fuel cell of claim 12,~~

A polymer electrolyte fuel cell comprising:

an electrode including a catalyst layer and a diffusion layer, said catalyst layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said catalyst layer differs between at said upstream portion and at said downstream portion, said upstream portion of said catalyst layer having a structure for preventing a drying-up of said cell, said downstream portion of said catalyst layer having a structure for preventing a flooding of said cell;

wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is larger at said upstream portion than at any other portion of the catalyst layer;

wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is smaller at said downstream portion than any other portion of the catalyst layer;

said diffusion layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said diffusion layer differs between at said upstream portion and at said downstream portion, said upstream portion of said diffusion layer having a structure for preventing a drying-up of said cell, said downstream portion of said diffusion layer having a structure for preventing a flooding of said cell, said diffusion layer having a water repellent layer and a substrate layer; and

wherein said structure of said diffusion layer for preventing a drying-up of said cell at said upstream portion includes a thickness of said diffusion layer being greater at said upstream portion than at any other portion of the diffusion layer.

24. (Currently amended) The polymer electrolyte fuel cell of claim 42 27, wherein said structure of said diffusion layer for preventing a flooding of said cell at said downstream portion includes said diffusion layer comprising pores, wherein a pore size of said diffusion layer is larger at said ~~upstream~~ downstream portion than at any other portion of the diffusion layer.

25. (Currently amended) The polymer electrolyte fuel cell of claim 42 27, wherein said structure of said diffusion layer for preventing a flooding of said cell at said downstream portion includes said diffusion layer comprising pores, wherein a pore amount of said diffusion layer is larger at said downstream portion than at any other portion of the diffusion layer.

26. (Currently amended) The polymer electrolyte fuel cell of claim 42 27, wherein said structure of said diffusion layer for preventing a flooding of said cell at said downstream portion includes a hydrophobicity of said water repellent layer being weaker at said downstream portion than at any other portion of the diffusion layer.

27. (Currently amended) ~~The polymer electrolyte fuel cell of claim 42,~~
A polymer electrolyte fuel cell comprising:
an electrode including a catalyst layer and a diffusion layer, said catalyst layer
being sectioned into a plurality of portions including an upstream portion and a
downstream portion along a reactant gas flow direction,
wherein a structure of said catalyst layer differs between at said upstream portion
and at said downstream portion, said upstream portion of said catalyst layer having a
structure for preventing a drying-up of said cell, said downstream portion of said catalyst
layer having a structure for preventing a flooding of said cell;

wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is larger at said upstream portion than at any other portion of the catalyst layer;

wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes said catalyst layer comprising a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is smaller at said downstream portion than any other portion of the catalyst layer;

said diffusion layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said diffusion layer differs between at said upstream portion and at said downstream portion, said upstream portion of said diffusion layer having a structure for preventing a drying-up of said cell, said downstream portion of said diffusion layer having a structure for preventing a flooding of said cell, said diffusion layer having a water repellent layer and a substrate layer; and

wherein said structure of said diffusion layer for preventing a flooding of said cell at said downstream portion includes a thickness of said diffusion layer being smaller at said upstream downstream portion than at any other portion of the diffusion layer.